IN THE UNITED STATES BANKRUPTCY COURT
FOR THE DISTRICT OF DELAWARE

In re:	)	**Chapter 11**
	)	
W.R. Grace & Co., et al.,	)	**Case No. 01-01139 (JKF)**
	)	**(Jointly Administered)**
	)	
Debtors.	)	

Claimants' Reply to W.R. Grace's Response to Claimants' Motion to Exclude Dr. R.J. Lee's Opinion on Cleavage Fragments

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Dated: August 18, 2003

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I. INTRODUCTION

W.R. Grace argues that Dr. Lee's cleavage fragment protocol and opinions are reliable and widely accepted by all, including the EPA. That was news to the EPA. The United States has filed a statement on behalf of the EPA that forcefully rejects Dr. Lee's protocol and opinions regarding cleavage fragments. After fully investigating the asbestos in Grace's Libby vermiculite and exploring Dr. Lee's cleavage fragment claims in its Superfund litigation, the United States cautioned against use of Dr. Lee's protocol:

> The United States believes that Dr. Lee's unique protocol for purportedly distinguishing between asbestos fibers and cleavage fragments significantly departs from accepted methodologies. Accordingly, the United States supports Claimants' Motion to Exclude Dr. R. J. Lee's Opinion on Cleavage Fragments. Use of Dr. Lee's protocol to determine asbestos levels should not be used in the Science Trial or in any context in this Bankruptcy Case.[1]

Dr. Lee's unique protocol is a conglomeration of procedures that Dr. Lee cherry-picked from various sources to create an obstacle course for each fiber. Contrary to Grace's claims, Dr. Lee's "protocol" has not been generally accepted by the scientific or regulatory communities. Dr. Lee's laboratory has mislabeled Libby amphibole asbestos fibers as "cleavage fragments." His "cleavage fragments" do not fit the generally accepted dimensions for cleavage fragments, which are usually greater than 1 micron in width and less than 10 to 1 in aspect ratio.

In light of its placement on EPA's watch list due to deficient quality assurance procedures, the R.J. Lee Group's misidentification of asbestos fibers as cleavage fragments is no surprise. As the United States makes clear, it is "the general scientific consensus (including Grace's pre-litigation assessments of the Libby ore body) that Libby amphibole is fibrous."[2] Dr. Lee's results and opinions fail the ultimate quality assurance test – logic. If Libby tremolite is mostly benign cleavage

[1] United States' Statement Regarding Asbestos Analysis Issues in W.R. Grace's Motion for Summary Judgment and Claimants' Motion to Exclude Dr. R. J. Lee's Opinion on Cleavage Fragments at 9-10 (Aug. 7, 2003) ("United States' Statement").

[2] Id. at 5.

fragments, why are so many Libby residents sick? Dr. Lee's opinions regarding cleavage fragments should be excluded.

II. DISCUSSION

A. Dr. Lee's "Protocol" is Scientifically Unreliable

Grace claims that Dr. Lee's protocol for distinguishing cleavage fragments from asbestos fibers is "well established and widely recognized."[3] But it is clear from Dr. Lee's affidavit that his protocol is a conglomeration of procedures in which each fiber is put through an asbestos obstacle course. It is a litigation-oriented procedure designed to exclude as many fibers as possible from laboratory counting.

Dr. Lee claims that he uses the same protocols established by OSHA, and cites two OSHA protocols in support.[4] But these protocols contain dimensional criteria for cleavage fragments that are ignored by Dr. Lee and contradict his findings. For example, OSHA Method ID-160 defines cleavage fragments as having "a moderate aspect ratio (usually less than 20:1)."[5] The average aspect ratio for Dr. Lee's "cleavage fragments" exceeded 20 to 1. In fact, Dr. Lee's laboratory labeled as cleavage fragments fibers with aspect ratios exceeding 100:1, and as high as 193:1.[6]

> OSHA Method ID-191 addresses the width of cleavage fragments and states:
>
> Most cleavage fragments of the asbestos minerals are easily distinguishable from true asbestos fibers. This is because true cleavage fragments usually have larger diameters than 1 um.[7]

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[3] Opposition of W.R. Grace & Co. to Claimants' Motion to Exclude Dr. R.J. Lee's Opinion on Cleavage Fragments at 3 ("Grace's Lee Response").

[4] Lee Aff. ¶ 25 (citing OSHA, Asbestos in Air, Method ID-160 (1988) (Lee Aff. Ex. 6); OSHA, Polarized Light Microscopy of Asbestos, Method ID-191 (1992) (Lee Aff. Ex. 7)).

[5] OSHA Method ID-160, at 2.

[6] See Longo Aff., Attach. D at 4, 21, 24, 29, and 39 (Attach. 21 to Claimants' Lee Motion).

[7] OSHA Method ID-191, at 9.

Again, Dr. Lee's obstacle course does not include this criterion. As Dr. Lee admits in his affidavit, only 8-20% of all particles in the ZAI testing exceed 1.0 micron in diameter.[8] Yet he claims 90% of the particles are cleavage fragments.

Under Dr. Lee's "protocol," every asbestos fiber must also have a combination of various characteristics, including striations along its length and curvature.[9] However, OSHA has clearly noted that these characteristics are not always present for asbestos:

> Asbestos fibers exist in bundles that are easily parted, show longitudinal fine structure and may be tufted at the ends showing "bundles of sticks" morphology. In the microscope some of these properties may not be observable. Amphiboles do not always show striations along their length even when they are asbestos.[10]

This is consistent with Dr. Longo's testimony that the individual fibrils in tremolite asbestos are not always apparent under the electron microscope.[11]

The requirement for curvature in Dr. Lee's protocol clearly is likewise inconsistent with amphibole asbestos fibers, which are ordinarily straight. OSHA specifically states that when examining asbestos, analysts should:

> Note the morphology of the fibers. Long, thin, *very straight fibers with little curvature* are indicative of fibers from the amphibole family. Curved, wavy fibers are usually indicative of chrysotile."[12]

Dr. Lee's "protocol" is geared towards exclusion of fibers. This is contrary to OSHA's directive for fiber identification, which states:

> If there is a question whether a fiber is asbestos or not, follow the rule:
>
> "WHEN IN DOUBT, COUNT." [13]

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[8] Lee Aff. ¶ 51.

[9] Lee Aff. ¶ 32, 35.

[10] OSHA Method ID-191, at 9.

[11] Deposition of William Longo at 44-45 (May 8, 2003) ("Longo Dep.") [Attach. 1].

[12] OSHA Method ID-191, at 10 (emphasis added).

[13] OSHA Method ID-160, at 8. Dr Lee's "protocol" takes the opposite approach – "Create doubt, don't count."

Dr. Lee's results not only contradict OSHA's definitions of cleavage fragments and its policy to count when in doubt, they contradict studies involving tremolite in consumer products. Dr. Lee claims that the procedures in his protocol were used by several scientists to distinguish tremolite cleavage fragments from asbestos fibers in children's play sand.[14] The study he referenced was published in a peer reviewed book and its results submitted to the Consumer Products Safety Commission. Nowhere does Dr. Lee's asbestos obstacle course appear in this study. In fact, Dr. Lee's opinions contradict the play sand studies' findings. In that study, the researchers found the tremolite cleavage fragments to have an average aspect ratio of 3.7 to 1 (i.e., the fibers were relatively "short" and "fat"). The log-normal distribution for cleavage fragments was towards low aspect ratios less than or equal to 5 to 1. None of the tremolite cleavage fragments had an aspect ratio of 20 to 1 or more.[15] In contrast, Dr. Lee's ZAI "cleavage fragments" have an average aspect ratio exceeding 20 to 1, and as high as 193 to 1. Thus, they are much longer and thinner than typical "blocky" cleavage fragments.[16] As the United States points out in its statement, even the dimensional criteria for cleavage fragments set forth by Grace's expert, Dr. E.B. Ilgren, contradict Dr. Lee's findings.[17]

In Daubert v. Merrell Dow Pharm., Inc., 509 U.S. 579, 584 (1993), plaintiff's experts picked facts from various published studies to come to opinions that contradicted the conclusions in the published studies. This is precisely what Dr. Lee has done here with his asbestos "protocol" whose results contradict the accepted dimensional criteria for cleavage fragments. As the United States points out, Dr. Lee's "use of counting criteria that have not been adopted into standard microscopic

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[14] Lee Aff. ¶ 27.

[15] A.M. Langer, et al., Distinguishing Between Amphibole Asbestos Fibers and Elongate Cleavage Fragments of Their Non-Asbestos Analogs, Mechanisms in Fibre Carcinogenesis at 258 (R.C. Brown, et al., eds., 1991) (Lee Aff. Exh. 8).

[16] Interestingly, the play sand study looked at cancer causing tremolite asbestos fibers in homes in Greece, which was found to have an average aspect ratio of 10.9 to 1. The log-normal distribution of these tremolite asbestos fibers was towards high aspect ratios greater than or equal to 10 to 1. Id. at 258. These are the typical aspect ratios found in the Libby fibers as well, and help explain why Libby amphiboles are lethal.

[17] United States' Statement at 8 – 9.

counting techniques is inappropriate."[18] Dr. Lee's opinions based on his unique and unscientific "protocol" should be excluded.

B. Dr. Lee's "Protocol" Has Not Been Scientifically Accepted

Without any support, Grace claims that Dr. Lee's protocol was reviewed and accepted by OSHA in its recent investigation of tremolite asbestos in Crayola crayons.[19] Nowhere does Dr. Lee's asbestos obstacle course appear in the OSHA report. More recently, the independent non-profit Research Triangle Institute (RTI) looked at the issue of asbestos in crayons.[20] RTI's report defined tremolite cleavage fragments using the accepted aspect ratios of less than 10 to 1.[21] This clearly contradicts Dr. Lee's protocol and findings, which call fibers with a 100 to 1 aspect ratio cleavage fragments.

Grace also claims that Dr. Lee's protocol was peer reviewed as part of the Quality Assurance Project Plan (QAPP) for the Southdown Marble Quarry, sponsored by the State of New Jersey and accepted by EPA.[22] Grace attaches the QAPP, which is dated January 24, 2001, and signed by the participants between January 25 and August 25, 2001. However, Dr. Lee's protocol, which is labeled, "Draft – Privileged and Confidential Work Product," is dated August 31, 2001. Nowhere is there any indication that Dr. Lee's protocol was actually peer reviewed by the participants and accepted by EPA. The Preface to the QAPP notes that the study was a living document and subject to modification to improve the accuracy of the sampling or analysis and that the "[p]rotocol structure portion of the risk will be undergoing a peer review during the study.[23] The protocol structure of the

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[18] Id. at 5.

[19] Grace's Lec Response at 2.

[20] See M.E. Beard, et al., Analysis of Crayons for Asbestos and Other Fibrous Materials, and Recommendations for Improved Analytical Definitions, Research Triangle Institute (Feb. 28, 2001) [Attach. 2].

[21] Id. at 7.

[22] Grace's Lee Response at 2.

[23] Quality Assurance Project Plan, Version 4.0, at 3 (Jan. 24, 2001) (Lee Aff. Ex. 12).

risk deals with what size fibers would be counted for purposes of regulatory risk assessment. Interestingly, QAPP rejected Dr. Lee's view that "cleavage fragments", as he defined them, should be excluded. Rather, all fibers meeting OSHA fiber dimensions, including particles identified by Dr. Lee's laboratory as cleavage fragments, were used in the risk assessment for this study.[24] As the United States suggests, if Dr. Lee wants to call long, thin tremolite particles "cleavage fragments", they should be considered as toxic as similarly sized fibers and counted.[25]

C. Dr. Lee's Algorithm Method Has Not Been Found to be Scientifically Reliable

Dr. Lee never looked at Claimants' or the Canadian Government's ZAI test samples. Rather, he used a mathematical algorithm to "determine" that the vast majority of asbestos fibers counted by other laboratories during ZAI testing were just harmless cleavage fragments. Dr. Lee claims that this algorithmic calculation confirms the results from his protocol. This same calculation was used by Dr. Lee in the Libby Superfund litigation to support Grace's cleavage fragment defense, which was rejected by EPA scientists. The Honorable Donald N. Molloy also necessarily rejected Dr. Lee's opinions by granting EPA's motion for summary judgment on liability.[26] While Grace claims Judge Molloy's opinion does not reject Dr. Lee by name, Dr. Lee was the crux of Grace's unsuccessful defense that the fibers still at Libby were harmless cleavage fragments. As discussed below, Dr. Lee's algorithmic calculation is unreliable and should be excluded.

To justify his mathematical calculations, Dr. Lee relies on two articles.[27] But these articles actually draw into question the reliability of the mathematical equation used by Dr. Lee. In the 1985

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[24] Sparta Township Environmental Asbestos Study, Final Report, at 35 [Attach. 3]. The study also used settled dust testing under ASTM Methods D-5755 and D-5756 to determine whether asbestos fibers were released from the Southdown Quarry and contaminating properties downwind. Id. at 37.

[25] United States' Statement at 9.

[26] See Claimants' Lee Brief at 25 and Attach. 31.

[27] See A. G. Wylie, et al., Characterizing and Discriminating Airborne Amphibole Cleavage Fragments and Amosite Fibers: Implications for the NIOSH Method, Am. Ind. Hyg. Assoc. J. 46(4):197-201 (1985) (Lee Aff. Ex. 20); G. Burdett, Final Report for R42:70: Quantitative Measurement of Asbestos and Other Fibers in Bulk Materials, IR/L/MF/98/02, Health & Safety Laboratory (1998) (Lee Aff. Ex. 21).

article (Wylie, et al.), the authors compared amosite asbestos fibers and cleavage fragments using a "discriminant function calculation" - a mathematical manipulation similar to Dr. Lee's algorithm. The authors concluded:

> We do not consider it practical to use the specific discriminant function we have derived as a basis for the regulation of asbestos fiber exposure. The magnitudes of the coefficients are too sensitive to slight changes in the populations.[28]

The second article (Burdett, et al.) looked at Wylie's data and identified several important and relevant limitations in using Wylie's discriminant function calculation. For example, the authors noted that Wylie's calculation "when applied to all fibres with lengths >0.5 um was less able to discriminate between asbestos and non-asbestos samples..."[29] This is a fatal blow to Dr. Lee since all of the fibers counted by Claimants' experts were greater than 0.5 microns in length. Burdett, et al., further noted that "no conclusion on a fibre-by-fibre basis can be drawn for particles >0.5 um wide unless their aspect ratio is < 3:1 in which case they lie outside the conventional definition of asbestos fibres and would be taken to be cleavage fragments."[30] Claimants' experts did not count particles with aspect ratios less than 3 to 1. Therefore, according to the very studies relied on by Dr. Lee, no conclusion can be drawn regarding the fibers counted in the ZAI studies using Wylie's discriminant function calculation.

Not surprisingly, Burdett, et al., confirm that the best way to distinguish between populations of asbestos fibers and cleavage fragments is to look at the average aspect ratio:

> The aspect ratio defines the shape of a fibre and appears to be the best parameter for distinguishing between asbestos and non-asbestos fibres. The median aspect ratio (table 15) for the >5um long fibres does appear to be a good discriminant by itself with values of >20:1 being characteristic asbestos and <10:1 characteristic of non-asbestos.[31]

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[28] Wylie, supra note 27, at 198.

[29] Burdett, supra note 27, at 82.

[30] Id.

[31] Id. at 65. The authors also state that the median width cleavage fragments will exceed 1.0 um.

Interestingly, the Wylie article determined that the vast majority of cleavage fragments had an aspect ratio of 10 to 1 or less. Further, the authors concluded that using an aspect ratio of 20 to 1 for fibers greater than 5 microns in length "eliminates most amphibole cleavage fragments."[32] Dr. Lee believes otherwise.

Because of the limitations and uncertainties associated with use of the discriminant function calculation as noted in these studies, Dr. Lee's opinions based on such calculations should be excluded. Dr. Lee's attempt to use this unreliable equation as quality assurance for his protocol should also be rejected. It is bogus quality assurance – the same defect EPA's audit found in Dr. Lee's laboratory. The aspect ratio is clearly recognized as the best criteria for distinguishing between asbestos fibers and cleavage fragments. Based on the aspect ratios of the particles released from ZAI, the vast majority are asbestiform in nature. Dr. Lee's calculations and opinions do not fit within the established and accepted dimensional criteria for asbestos fibers and cleavage fragments.

D. Dr. Lee's Conclusions Are Inconsistent with His Bulk Sample Analysis of ZAI

Grace and Dr. Lee have now found themselves in a corner. Dr. Lee's bulk test results show a significant percentage of asbestiform fibers in ZAI, and find only asbestiform fibers (not cleavage fragments) in the fine dust. Their dilemma was how to explain that Dr. Lee finds virtually none of this asbestos in the air when ZAI is disturbed. Desperate to extricate himself, Dr. Lee now claims that most of the asbestos in ZAI is in large sized bundles and "will not be released into the air under any foreseeable circumstance."[33] Grace's argument ignores its own testing and admissions regarding the friable nature of its asbestos. Asbestos bundles can easily break up on disturbance.[34] Claimants' expert, Dr. Longo, testified that he found airborne asbestos particles greater than 0.3 microns in width

[32] Wylie, supra note 27, at 201. The average cleavage fragment reported by Dr. Lee had an average aspect ratio exceeding 20 to 1.

[33] Grace's Lee Response at 13.

[34] See Claimants' Lee Brief at 15.

that are most likely bundles.[35] Contrary to Dr. Lee's opinions, asbestos bundles certainly get into the air.

Realizing that his own test results do not make logical sense, Dr. Lee has now concocted an "electrostatic charge theory" to try to explain why cleavage fragments would readily become airborne while asbestos fibers would remain captive in the product. Dr. Lee's claims are patently erroneous in light of the fact that his "cleavage fragments" have the same dimensions as asbestos fibers. Dr. Lee's claim should be viewed as an admission that Libby asbestos fibers are readily made airborne upon disturbance.[36]

E. EPA's Nationwide Alert Concerning Dr. Lee and His Laboratory is Compelling

Dr. Lee claims that he was unaware until recently of EPA's concerns.[37] This is clearly contradicted by the record in the Libby Superfund Litigation, where the EPA repeatedly criticized Dr. Lee's methods and opinions as unreliable. Clearly, EPA and the Justice Department could not have been clearer in their rejection of Dr. Lee's methods and opinions regarding cleavage fragments.[38] In addition, the recent United States filing calls into question the credibility of Dr. Lee's qualifications. In its summary judgment motion, Grace represented that Dr. Lee was asked by EPA to devise a standardized protocol for the analysis of vermiculite. EPA investigated and was unable to confirm this representation.[39] Grace's claims about Dr. Lee, like his protocol, raise serious questions.

III. CONCLUSION

Dr. Lee's opinions on "fibers versus cleavage fragments" do not fit within the established and accepted dimensional criteria for cleavage fragments. The United States has declared Dr. Lee's

[35] Longo Dep. at 45-46 [Attach. 1].

[36] In an effort to denigrate Grace's historical testing of ZAI, Grace and Dr. Lee ignore the fact that Grace performed "discriminatory counting" in order to exclude non-asbestos particles, including cleavage fragments, in its laboratory test results. For a more detailed discussion, see Claimants' Response to Grace's Motion for Summary Judgment at 7.

[37] Lee Aff. ¶ 64.

[38] United States' Statement at 9-10.

[39] Id. at 3 n1.

unorthodox methods and opinions to be scientifically unreliable. For these reasons, and the reasons set forth in Claimants' memorandum in support of their motion, Dr. Lee's opinions should be excluded.

RESPECTFULLY SUBMITTED,

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Dated: August 18, 2003

EXHIBITS

1. Excerpts from Dr. William E. Longo Deposition (May 8, 2003).

2. M. E. Beard, et al., Analysis of Crayons for Asbestos and Other Fibrous Materials, and Recommendations for Improved Analytical Definitions, Research Triangle Institute (Feb. 28, 1002).

3. Sparta Township Environmental Asbestos Study, Final Report.

ATTACHMENT 1

IN THE UNITED STATES BANKRUPTCY COURT

FOR THE DISTRICT OF DELAWARE

IN RE:	)	
	)	CHAPTER 11
W.R. GRACE & CO., ET AL.,	)	CASE NO. 01-01139(JKF)
	)	
Debtors.	)	(JOINTLY ADMINISTERED)

DEPOSITION OF

WILLIAM E. LONGO, Ph.D.

May 8, 2003

9:25 a.m.

2100 Bank of America Plaza

600 Peachtree Street

Atlanta, Georgia

Frances Buono, RPR, CCR-B-791

BROWN Reporting INC.

1740 Peachtree St, N.W.
Atlanta, GA 30309
404-876-8979

two fibers touching --

A. He calls that one fiber.

Q. Dr. Longo, be patient with me. You have to let me finish the sentence so that --

A. I am sorry, I thought you did.

Q. -- when I get hit by a car and somebody else is reading this they will understand what I was asking.

If your analyst sees in a microscope two fibers which are touching, how is that coded?

A. That will be called two fibers.

Q. That would not be called a bundle?

A. No. If he can see -- and again, with chrysotile it is very easy to see that because of its hollow structure so you get definition inside the structure.

Amphiboles are very difficult to resolve multiple fibers if they are stacked against each other and in parallel.

So, I mean, I know where you are going with this because there are plenty of fibers in our count sheets that are greater than a .8 in width, but the analyst, if he cannot make out that it is absolutely multiple fibers, he may think as mine, he has to dictate to call it a fiber.

Q. What that means is, Dr. Longo, some of the laboratory sheets which your laboratory has reported out in samples as fibers, you are now testifying, in fact, may be bundles?

A. Yes, that is a common problem with these types of structure.

Q. And can you tell me why they were not reported out as bundles?

A. Because the analyst cannot see that there is individual single fibers stacked together in a bundle. All they can see is one electron dense material.

Let me show you an example. I think we have an SEM photo in here. If you take a look at this. Now this is a real long one. But this is a bundle of tremolite.

And there is almost two separate bundles here but under the TEM if you were to take one of these bundles and look at it, that is going to look like a single fiber that has things sticking out the end but they can't call it a bundle unless they can see all the different fibers.

Q. I guess I don't understand what you have said. You have shown me a photograph of something that appears, even to me, to look like a bundle?

A. This is an SEM. This is a scanning electron microscope that allows you to see surface features. So you are looking right at the top and you can see the things laying on top of each other. But you remember, the TEM you are looking through it so you don't get any surface features, and these are electron dense enough that you are not seeing internal structure.

Q. Is there any issue here of technician competence with respect to whether what is seen under the microscope is reported as an F or fiber versus a B or bundle?

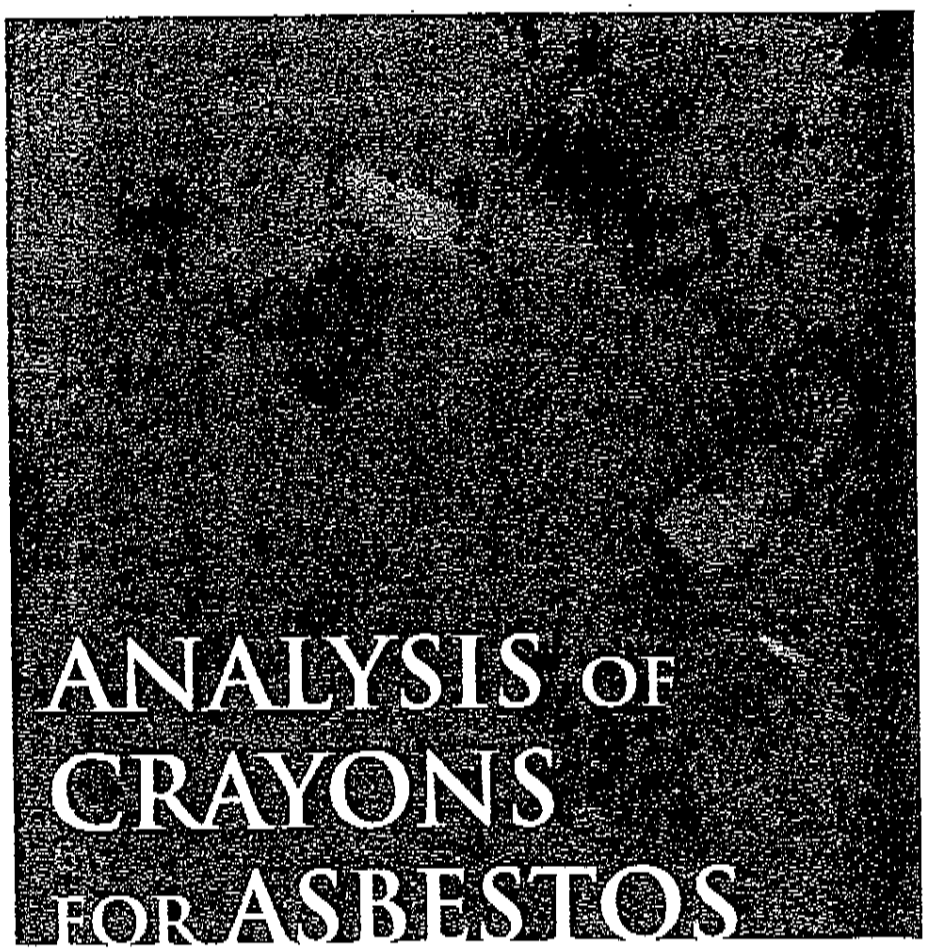
A. No. Here I have drawn you a bundle, and looking at the top of it you can see individual ridges, but under the TEM here is what it would look like.

Under the SEM you would have this, under the TEM you would have this. Somebody would look at that and mistakenly go all right, I am seeing little ridges here, that is a cleavage fragment, but in reality it is just a bundle.

So that is why the rules are so important in these counting rules that you get substantially parallel sides and 5-to-1 aspect ratio.

Q. In your laboratory, one of the analysts is

ATTACHMENT 2



and other Fibrous Materials,
and Recommendations for
Improved Analytical Definitions

Table 1.
Properties and Concentration Estimates of Atomic Tangerine Crayon by Polarized Light Microscopy

Optical Property	Fibrous Talc	Tremolite Cleavage Fragments	Anthophyllite	Transitional Fibers
Morphology	Wavy, shredded	Blocky	Needle-like, fibrous	Rod-like, tabular
Aspect Ratio	>20:1	<10:1	>20:1	10:1 to 20:1
Color	Colorless	Colorless	Colorless	Colorless
Pleochroism	None	None	None	None
Birefringence	$\Delta = 0.04$	$\Delta = 0.025 - 0.03$	$\Delta = 0.025$	$D = 0.035$
Extinction Type	Parallel to inclined at 2° - 3°	Inclined to 17°	Parallel	Parallel
Refractive Indices	$\alpha = 1.545$ $\gamma = 1.585$	$\alpha = 1.605$ $\gamma = 1.630 - 1.635$	$\alpha = 1.610$ $\gamma = 1.635$	$\alpha = 1.550$ $\gamma = 1.585$
Sign of Elongation	Length slow (Positive)	Length slow (Positive)	Length slow (Positive)	Length slow (Positive)
Estimated Area %	**Trace - 2%**	**5 % - 10%**	**Trace**	**3% - 5%**

The three lots of Gouverneur fibrous talc (numbered 112399, 121099, and 051700) were microscopically identical. PLM oil mounts having refractive indices (RIs) of 1.600 through RI 1.640 were used to identify any fibrous forms of the three asbestos types identified by XRD. Twenty oil-mount slides were made and scanned using dispersion staining and Becke line techniques for determining RIs. Only two fiber bundles were identified as possible asbestiform (20:1 aspect ratio) anthophyllite

ATTACHMENT 3

Sparta Township Environmental Asbestos Study

Final Report of the Results of Air and House Dust Sampling

Final Report

Prepared by:

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Junfeng Zhang, Ph.D. . - EOHSI
Natalie Freeman, Ph.D. . - EOHSI
Lih-Ming Yiin, Ph.D. . - EOHSI
Robert Hague, Ph.D., C.I.H. . - EOHSI

Laboratory Analyses conducted by R.J. Lee Group
Investigator: Robert J. Lee, Ph.D.

Additional analyses conducted by EMS Laboratories

Statistical Analysis conducted by Wayne Berman, Ph.D. – Areolas Inc.

Project Manager:

Alan H. Stern, Dr.P.H.
NJ Department of Environmental Protection

October 4, 2002

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3 samples with one structure; and

108 samples with no structures.

Fitting these data (for example, Ritter 1998) indicate that they are indeed adequately described by a Poisson distribution and that the best fit distribution exhibits a mean of 0.045 structures. Thus, the average number of structures that would be expected on any single sample taken at any comparable outdoor location in the area is 0.045. Multiplying this expectation value by the analytical sensitivity for the sample measurements in the study (0.0003 s/cm^3), results in an estimated airborne concentration of 1.35×10^{-5} s/cm^3 for tremolite structures.

Note that analytical sensitivity is defined as the airborne concentration that would result in detection of a single structure in a sample. Therefore multiplying the analytical sensitivity by the number of structures expected on a sample provides an estimate of the average area-wide airborne concentration represented by that measurement.

As a check, the above calculation can be repeated with the inclusion of the remote samples. Thus, the distribution with the remote samples included is:

1 sample with two structures;

4 samples with one structure; and

163 samples with no structures.

These data are also adequately fit by a Poisson with a mean of 0.035 structures. Moreover, a chi square test for differences between this distribution and the distribution indicated above suggests that they are not statistically distinguishable.

The elevated area-wide average concentration of tremolite structures estimated in the above analysis can be translated into an estimate of lifetime cancer risk. The corresponding risk estimates are derived using each of two approaches.

Four of the six tremolite structures that were detected exhibit dimensions corresponding to NIOSH 7402 fibers (NIOSH 1989). The current U.S. Environmental Protection Agency (EPA) standard for including structures for cancer risk assessment is that they satisfy the NIOSH 7402 dimensional criteria and that they be true asbestos fibers. However, there is no EPA accepted procedure for distinguishing true fibers from other elongated structures (e.g., cleavage fragments) of similar mineral composition that is applicable to isolated structures found in the air. Therefore, to be conservative, all four of these structures are included in the following analysis, even though three of the four structures have been identified by the laboratory as cleavage fragments, and therefore may not be true fibers (see Appendix 3 for the laboratory characterization of individual structures as fibers or cleavage fragments).

Table 8. Dust Sampling Zones

Zone	Number of Houses	Distance from Quarry	Average Age of Houses
Near	10	0.5 – 1.0 miles	11 years
Middle	15	1.0 – 1.25 miles	28 years
Far	3	> 1.5 miles	49 years

Table 9. Data for positive Dust Samples

Sampling Date	Location	Distance	Number of Structures Detected	Type	Protocol / 7402 structures	Concentration in house dust (million s/g)	Age of House
3/17/2001	Middle Zone (D36)*	1.1 miles	1	tremolite	Both	0.81	40 years
2/12/2001	Far Zone (D12)	1.9 miles	1	tremolite	Both	0.95	55 years

*: detected positive in QC analysis, containing tremolite cleavage structures.

Statistical Analysis of Dust Sampling Data

The settled dust sampling campaign was designed primarily to test for the presence of gross trends in the deposition of asbestos structures inside residences with distance from the Quarry. This design was adopted based on the hypothesis that, if the Quarry were the source of asbestos structures, then the concentration of structures in accumulated house dust would be highest in houses closest to and downwind of the Quarry and lower in areas further from the Quarry. To accomplish this, the residential area that lies adjacent to the Quarry in a downwind direction (under prevailing conditions) was divided into near, middle, and far zones. If sufficient asbestos were found, then by collecting multiple samples from each zone and evaluating average concentrations from pooled results within each zone, differences in the observed content of asbestos in the dust could suggest a general direction from the source of the asbestos.

Fifty-four settled dust samples were collected from the residential area near the Quarry. Among the 54 dust samples, a total of only two putative asbestos structures (both tremolite) were detected (one on each of two samples). Note that, as with the air samples, the structures are defined as "putative" because, while they satisfy the dimensional criteria for asbestos structures and they are both composed of asbestos-related minerals (tremolite), there is laboratory evidence that they may not be true fibers (see Appendix 4). No asbestos structures were detected in any of the other dust samples.

The distribution by zone of the samples collected is provided in Table 10.

CERTIFICATE OF SERVICE

I certify that a copy of the foregoing Claimants' Reply to W.R. Grace's Response to Claimants' Motion for Summary Judgment and Claimants' Reply to W.R. Grace's Response to Claimants' Motion to Exclude Dr. R.J. Lee's Opinions on Cleavage Fragments have been served upon the following counsel of record by Federal Express Overnight Mail this 18th day of August, 2003:

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